

【特許請求の範囲】

【請求項1】 基板の表面に形成されたパターン電極と、このパターン電極の表面に設けられたバンパ状のプローブ端子とを備え、被検査体の電気的特性検査を行う際に用いられるコンタクタであって、上記プローブ端子とパターン電極との間に導電性の管状弾性部材を介在させたことを特徴とするコンタクタ。

【請求項2】 上記プローブ端子は、先端に平坦な接触面を有し、且つ、その基端部から先端に向かって徐々に細くなるバンパとして形成されていることを特徴とする請求項1に記載のコンタクタ。

【請求項3】 上記基板がセラミックスにより成形されていることを特徴とする請求項1または請求項2に記載のコンタクタ。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は、被検査体の電気的特性検査を行う際に用いられるコンタクタに関し、更に詳しくは、KGD (Known Good Die) の検査に好適に用いることができるコンタクタに関する。

【0002】

【従来の技術】 被検査体、例えば半導体ウエハ（以下、単に「ウエハ」と称す。）に多数形成されたICチップの電気的特性検査をする場合にはコンタクタとしてプローブカードが用いられる。プローブカードは検査時にウエハの電極用パッドと接触した時にテストとICチップ間で検査用信号の授受を中継する役割を果たしている。

【0003】 ところで最近、ICチップの集積度が急激に高まり、電極パッドの配列が益々狭ピッチ化している。狭ピッチ化に対応したプローブカードとして例えば図3に示した垂直針を有するプローブカードやメンブレンプローブカードがある。前者のプローブカードは、同図に示すように、複数のプローブ針11が上下方向に互いに平行に配置された3枚の案内板12、13、14の貫通孔12A、13A、14Aで垂直に支持された構造である。また、後者のメンブレンプローブカードはメンブレンに多数のバンパ端子が配列されたものである。

【0004】

【発明が解決しようとする課題】 しかしながら、従来の垂直針タイプのプローブカードの場合には、図3に示すように垂直針11を支持するために複数の案内板が必要で、垂直針11の支持構造が複雑であるという課題があった。また、近年、ICチップの実装技術の進歩によりフリップチップ実装技術が開発され、品質保証されたベアチップ、即ちKGDの取り引きが行われつつある。しかも、フリップチップ実装に備えて電極パッドに半田バンパの形成されたKGDが供給されることがある。この場合には品質保証のために半田バンパのある状態でベアチップの検査することになるが、この際に従来の垂直針タイプのプローブカードでは半田バンパの高低差を吸収

することができるが、垂直針の針先で半田バンパを傷つけ易くコンタクト面で課題があった。また、バンパ端子タイプのプローブカードの場合にはバンパ端子自体で半田バンパの高低差をうまく吸収できず、半田バンパとのコンタクトに課題があった。

【0005】 本発明は、上記課題を解決するためになされたもので、プローブ端子の支持構造が簡単で、しかも電極の高低差を吸収することができるコンタクト性に優れたコンタクタを提供することを目的としている。

【0006】

【課題を解決するための手段】 本発明の請求項1に記載のコンタクタは、基板の表面に形成されたパターン電極と、このパターン電極の表面に設けられたバンパ状のプローブ端子とを備え、被検査体の電気的特性検査を行う際に用いられるコンタクタであって、上記プローブ端子とパターン電極との間に導電性の管状弾性部材を介在させたことを特徴とするものである。

【0007】 また、本発明の請求項2に記載のコンタクタは、請求項1に記載の発明において、上記プローブ端子は、先端に平坦な接触面を有し、且つ、その基端部から先端に向かって徐々に細くなるバンパとして形成されていることを特徴とするものである。

【0008】 また、本発明の請求項3に記載のコンタクタは、請求項1または請求項2に記載の発明において、上記基板がセラミックスにより成形されていることを特徴とするものである。

【0009】 以下、図1の(a)、(b)及び図2に示す実施形態に基づいて本発明を説明する。本実施形態のコンタクタ1は、例えば図1、図2に示すように、複数層の内部配線パターンが積層されたセラミックス基板2と、このセラミックス基板2の表面にマトリックス状に配列された複数の正方形のパターン電極3と、このパターン電極3上にそれぞれ配設されたバンパ状のプローブ端子4とを備え、必要に応じてプローブ端子4の数を設定し、複数のチップを同時に検査できるようになっている。そして、プローブ端子4とパターン電極3との間には導電性金属からなる管状弾性部材5が介在し、この管状弾性部材5が検査時の針圧に即して弾性変形すると共にパターン電極3とプローブ端子4間を電気的に接続している。

【0010】 上記管状弾性部材5は、例えばベリリウム-銅合金、銅等の導電性金属によって外径が100~150 μ m、肉厚が2~3 μ m、長さが100~150 μ mの大きさに形成されている。その平面形状は図2からも明かなように略正方形を呈している。そして、管状弾性部材5の肉厚によって検査時の針圧を適宜調整するようにしてある。この管状弾性部材5はパターン電極3の表面に露着されている。また、管状弾性部材5の上端部中央にはベリリウム-銅合金、ニッケル-金合金等の導電性金属からなるメッキ部6が形成され、このメッキ

部6にプローブ端子4が設けられている。このプローブ端子4は図2に示すように管状弾性部材5の中心に設けられているが、チップの電極パッドの配置に応じてプローブ端子4を管状弾性部材5の中心から適宜偏位させて設けることもできる。

【0011】上記バンプ状のプローブ端子4は、例えば図1に示すように、基端部から先端部にかけて徐々に細くなり、しかもその先端にほぼ正方形の平坦面を有する、四角錐台状に形成されている。図示していないが、プローブ端子4は、電極パッドより硬度の高い材料、例えばダイヤモンド、サファイヤ、石英等の鉱石によって四角錐台状に形成されたコア部と、その外面に例えば金、ロジウムあるいはこれらの合金等の良導性金属によってコーティングされた導電膜とからなっている。そして、導電膜の基端部がメッキ部6と接続され、導電膜を介してチップの電極パッドとの導通を図っている。プローブ端子4はパターン電極3表面からの高さが例えば50~100 μm に形成され、その先端の平坦面の辺長は例えば5~200 μm に形成されている。平坦面の辺長が5 μm 未満ではプローブ端子4が電極パッド内に食い込んだりもプローブ端子4の周囲と電極パッドとの接触抵抗を十分確保することが難しく、200 μm を超えると電極パッドに対する食い込みが難しくなる虞がある。バンプ状のプローブ端子4は、例えば化学的気相成長法等のプロセス技術を用いることにより形成することができる。また、プローブ端子4は四角錐台状に限らず、円錐台形状に形成したものであってもよい。

【0012】次に、図3を参照しながら動作について説明する。複数のヘアチップTが収納されたキャリア（図示せず）をプローブ装置のX、Y、Z及び θ 方向に移動可能な載置台（図示せず）上に載置した後、載置台がプローブ装置に装着されたコンタクト1の真下まで移動する。次いで、載置台が上昇すると半田バンプBがプローブ端子4と接触する。更に、載置台がオーバドライブするとプローブ端子4に針圧が作用する。この際、ヘアチップTの複数の半田バンプB間で高低差があってもそれぞれの半田バンプBの高さに応じて管状弾性部材6が図3の一点鎖線で示す状態から実線で示す状態まで弾性変形しても半田バンプB間の高低差を吸収して各プローブ端子4がそれぞれの半田バンプB内に確実に食い込んで確実にコンタクトでき、テストとヘアチップT間を導通できる状態にする。この状態でテストから所定の検査用信号を送信するとパターン電極3、プローブ端子4を介してヘアチップTで検査用信号を受信し、検査結果信号を逆の経路を辿ってテストへ送信する。その後、キャリアが下降して半田バンプBがプローブ端子4から離れると、プローブ端子4は図3の実線で示す状態から元の一点鎖線で示す状態まで戻り、ヘアチップTの検査を終了し、ヘアチップTをインデックス送りして次のヘアチップTの検査へと移る。

【0013】プローブ端子1が半田バンプBに食い込む際に、プローブ端子4の先端の平坦面周囲のエッジから半田バンプBに対してせん断力が作用し、半田バンプBの表面をエッジで切断し、プローブ端子4が半田バンプBに食い込み始める。その後のヘアチップTの上昇で、プローブ端子4の周囲で半田バンプBを周囲へ押し広げながら徐々に食い込み、半田バンプBとの良好な導通を確保する。この状態で検査を実施すれば、プローブ端子4と半田バンプBとの間で確実に信号の授受を行うことができ信頼性の高い検査を行うことができる。

【0014】以上説明したように本実施形態によれば、セラミックス基板2の表面に形成されたパターン電極3と、このパターン電極3の表面に設けられたバンプ状のプローブ端子4とを備え、ヘアチップTの電気的特性検査を行う際に用いられるコンタクト1であって、プローブ端子4とパターン電極3との間に導電性の管状弾性部材5を介在させたため、プローブ端子4の支持構造が簡單で、しかも半田バンプBの高低差を吸収して半田バンプBに対して確実にコンタクトすることができる。また、本実施形態によれば、プローブ端子4を配線構造を介することなくセラミックス基板1に接続しているため、電気抵抗が小さく高周波特性に優れ、しかも高速検査を確実に行うことができる。また、プローブ端子4がバンプ状に形成されているため、狭ピッチ化したヘアチップTに対しても何等問題なく対応することができ、しかもヘアチップTの電極パッドPの配列に即してプローブ端子4を配列することができ、その配列自由度を高めることができる。また、上記プローブ端子4は四角錐台状のバンプとして形成したため、先端の平坦面周囲のエッジから半田バンプBに対してせん断力を付与して半田バンプB内に確実に食い込み、半田バンプBとのコンタクト性を更に高めることができる。

【0015】特に、ヘアチップTで取り引きする場合、KGDとして市場に出す必要があり、しかもフリップチップ実装に備えて電極パッドに半田バンプBを設けた状態で市場に出すこともある。このような場合に本実施形態のコンタクト1を用いれば、半田バンプBとプローブ端子4とのコンタクトが良好で、半田バンプBを損なうことないため、KGD用のコンタクトとして好適に用いることができる。しかも、ウエハ状態でKGDを供給する場合には、ウエハ状態で複数のチップを同時に検査するコンタクトを作るのも容易である。

【0016】尚、上記実施形態では、プローブ端子4を半田バンプBにコンタクトさせて検査する場合について説明したが、アルミニウム等の電極パッドに接触させる場合についても同様に検査することができる。また、

【0017】

【発明の効果】本発明の請求項1~請求項3に記載の発明によれば、プローブ端子の支持構造が簡單で、しかも電極の高低差を吸収することができるコンタクト性に優

れたコンタクタを提供することができる。

【図面の簡単な説明】

【図1】 本発明のコンタクタの要部を拡大して示す斜視図である。

【図2】 図1に示すコンタクタの一部を示す平面図である。

【図3】 図1に示すコンタクタのプロープ端子の動作説明図である。

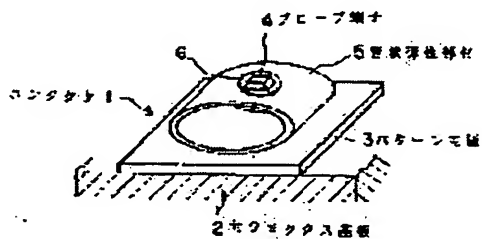
【図4】 従来の垂直針タイプのプロープカードの要部を

示す縦方向の断面図である。

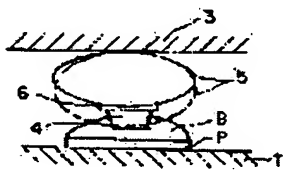
【符号の説明】

- 1 コンタクタ
- 2 セラミックス基板
- 3 パターン電極
- 4 プロープ端子
- 5 管状弾性部材
- T ヘアチップ
- B 半田バンプ

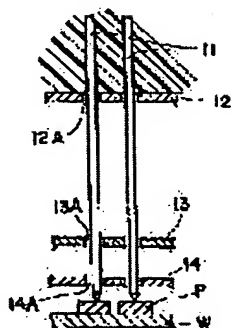
【図1】



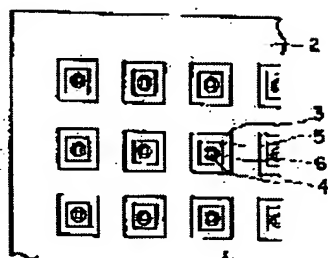
【図3】



【図4】



【図2】



PATENT ABSTRACTS OF JAPAN

(11)Publication number : 11-326381

(43)Date of publication of application : 26.11.1999

(51)Int.Cl.

G01R 1/073

H01L 21/66

(21)Application number : 10-156692

(71)Applicant : TOKYO ELECTRON LTD

(22)Date of filing : 20.05.1998

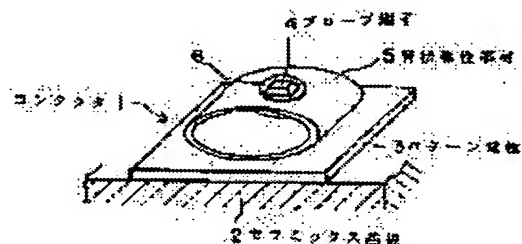
(72)Inventor : IINO SHINJI
YAMASAKA CHIKAHITO

(54) CONTACTOR

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a contactor with excellent contacting ability which achieves a simple support structure of a probe terminal and moreover, an absorption of difference in height of electrodes.

SOLUTION: This contactor 1 is provided with a pattern electrode 3 formed on the surface of a ceramics substrate 2 and a bump-shaped probe terminal 4 provided on the surface of the pattern electrode 3. An electroconductive tubular elastic member 5 is interposed between the probe terminal 4 and the pattern electrode 3. In this case, the probe terminal 4 has a flat contact surface at the tip thereof while being preferably formed as bump gradually tapered toward the tip thereof from the base end part thereof.



LEGAL STATUS

[Date of request for examination] 18.09.2000

[Date of sending the examiner's decision of rejection] 28.05.2002

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

Copyright (C); 1998,2003 Japan Patent Office

*** NOTICES ***

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.**** shows the word which can not be translated.

3.In the drawings, any words are not translated.

CLAIMS**[Claim(s)]**

[Claim 1] The contactor which is a contactor used in case it has the pattern electrode formed on the surface of the substrate, and the probe terminal of the shape of a bump prepared in the front face of this pattern electrode and electrical-characteristics inspection of an inspected object is conducted, and is characterized by making a conductive tubular elastic member intervene between the above-mentioned probe terminal and a pattern electrode.

[Claim 2] The above-mentioned probe terminal is a contactor according to claim 1 which has the flat contact surface at a head, and is characterized by being formed as a bump who becomes thin gradually toward a head from the end face section.

[Claim 3] The contactor according to claim 1 or 2 characterized by fabricating the above-mentioned substrate with the ceramics.

[Translation done.]

*** NOTICES ***

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.**** shows the word which can not be translated.

3.In the drawings, any words are not translated.

DETAILED DESCRIPTION**[Detailed Description of the Invention]****[0001]**

[Field of the Invention] This invention relates to the contactor which can be used suitable for inspection of KGD (Known Good Die) in more detail about the contactor used in case electrical-characteristics inspection of an inspected object is conducted.

[0002]

[Description of the Prior Art] When carrying out electrical-characteristics inspection of IC chip formed in the inspected object (a "wafer" is only called hereafter.), for example, a semi-conductor wafer, a probe card is used as a contactor. [much] The probe card has played the role which relays transfer of a checking signal to a circuit tester between IC chips, when the pad for electrodes of a wafer is contacted at the time of inspection.

[0003] By the way, the degree of integration of IC chip increases rapidly, and the array of an electrode pad has formed the ** pitch increasingly recently. There are the probe card and membrane probe card which have the vertical needle shown in drawing 3 as a probe card corresponding to the formation of a ** pitch.

The former probe card is the structure vertically supported by the breakthroughs 12A, 13A, and 14A of the guide plates 12, 13, and 14 of three sheets with which two or more probe needles 11 of each other [the vertical direction] have been arranged at parallel, as shown in this drawing. Moreover, as for the latter membrane probe card, many bump terminals are arranged by the membrane.

[0004]

[Problem(s) to be Solved by the Invention] However, in the case of the probe card conventional vertical needle type, as shown in drawing 3 , in order to support the vertical needle 11, two or more guide plates were required, and there was a technical problem that the supporting structure of the vertical needle 11 was complicated in it. Moreover, flip chip mounting technology is developed by advance of the mounting technology of IC chip, and dealings of the bare chip whose quality was guaranteed, i.e., KGD, are being conducted in recent years. And KGD by which the solder bump was formed in the electrode pad in preparation for flip chip mounting may be supplied. In this case, although a bare chip will inspect in the condition that there is a solder bump for QA, and a solder bump's difference of elevation was absorbable with the probe card conventional vertical needle type on this occasion, the technical problem occurred in respect of contact that it is easy to wound a solder bump at the needle point of a vertical needle. Moreover, in the case of the bump terminal type probe card, a solder bump's difference of elevation could not be well absorbed with the bump terminal itself, but the technical problem was in contact by the solder bump.

[0005] It was made in order that this invention might solve the above-mentioned technical problem, and the supporting structure of a probe terminal is easy and it aims at offering the contactor excellent in the contact nature which can moreover absorb the difference of elevation of an electrode.

[0006]

[Means for Solving the Problem] The contactor of this invention according to claim 1 is a contactor used in case it has the pattern electrode formed on the surface of the substrate, and the probe terminal of the shape of a bump prepared in the front face of this pattern electrode and electrical-characteristics inspection of an inspected object is conducted, and is characterized by making a conductive tubular elastic member intervene between the above-mentioned probe terminal and a pattern electrode.

[0007] Moreover, in invention according to claim 1, the above-mentioned probe terminal has the flat contact surface at a head, and the contactor of this invention according to claim 2 is characterized by being formed as a bump who becomes thin gradually toward a head from the end face section.

[0008] Moreover, the contactor of this invention according to claim 3 is characterized by fabricating the above-mentioned substrate with the ceramics in invention according to claim 1 or 2.

[0009] Hereafter, this invention is explained based on the operation gestalt shown in (a) of drawing 1 , (b), and drawing 2 . The contactor 1 of this operation gestalt For example, the ceramic substrate 2 with which the laminating of the internal circuit pattern of two or more layers was carried out as shown in drawing 1 and drawing 2 , The pattern electrode 3 of the shape of two or more square arranged in the shape of a matrix on the front face of this ceramic substrate 2, It has the probe terminal 4 of the shape of a bump arranged on this pattern electrode 3, respectively, the number of the probe terminals 4 is set up if needed, and two or more chips can be simultaneously inspected now. And between the probe terminal 4 and the pattern electrode 3, the tubular elastic member 5 which consists of a conductive metal intervened, and while this tubular elastic member 5 bases and carries out elastic deformation to the stylus pressure at the time of inspection, between the probe terminals 4 is electrically connected with the pattern electrode 3.

[0010] The above-mentioned tubular elastic member 5 is formed in the magnitude 2-3 micrometers and whose die length 100-150 micrometers and thickness are 100-150 micrometers for an outer diameter with conductive metals, such as for example, a beryllium-copper alloy and copper. The flat-surface configuration is presenting the shape of an abbreviation square like [it is ***** and] also from drawing 2 . And the thickness of the tubular elastic member 5 has adjusted the stylus pressure at the time of inspection suitably. Joining of this tubular elastic member 5 is carried out to the front face of the pattern electrode 3. Moreover, the plating section 6 which consists of conductive metals, such as a beryllium-copper alloy and a nickel-gold alloy, is formed in the center of the upper bed section of the tubular elastic member 5, and the probe terminal 4 is formed in this plating section 6. Although this probe terminal 4 is formed in the core of the tubular elastic member 5 as shown in drawing 2 , according to arrangement of the electrode pad of a chip, the probe terminal 4 can be suitably deflected from the core of the tubular elastic member 5, and can also be prepared.

[0011] As shown in drawing 1 , the bump probe terminal 4 of the above becomes thin gradually over the end face section to a point, and is formed in the shape of [which moreover has a square flat side mostly at

the head] rectangular-head frustum. Although not illustrated, the probe terminal 4 consists of the core section formed in the shape of rectangular-head frustum with ores, such as an ingredient with a degree of hardness higher than an electrode pad, for example, a diamond, sapphire, and a quartz, and electric conduction film in which coating was carried out to the outside surface by good conductive metals, such as gold, rhodiums, or these alloys. And the end face section of the electric conduction film is connected with the plating section 6, and a flow with the electrode pad of a chip is in drawing through the electric conduction film. The height from pattern electrode 3 front face is formed in 50-100 micrometers, and the side length of the flat side at the head is formed in 5-200 micrometers for the probe terminal 4. When it is difficult for the side length of a flat side to secure enough the contact resistance of the peripheral surface of the probe terminal 4, and an electrode pad although the probe terminal 4 eats away in an electrode pad in less than 5 micrometers and it exceeds 200 micrometers, there is a possibility that interlocking over an electrode pad may become difficult. The bump-like probe terminal 4 can be formed by applying process techniques, such as chemical vapor deposition. Moreover, the probe terminal 4 may be formed not only in the shape of rectangular-head frustum but in a truncated-cone configuration.

[0012] Next, actuation is explained, referring to drawing 3. After laying the carrier (not shown) with which two or more bare chips T were contained on an installation base (not shown) movable in X, Y, Z, and the direction of theta of probe equipment, an installation base moves to just under the contactor 1 with which probe equipment was equipped. Subsequently, lifting of an installation base contacts the solder bump B for the probe terminal 4. Furthermore, if an installation base carries out an exaggerated drive, stylus pressure will act on the probe terminal 4. Under the present circumstances, even if there is the difference of elevation among the solder bumps B of the plurality of a bare chip T, according to each solder bump's B height, the tubular elastic member 6 carries out elastic deformation to the condition shown as a continuous line from the condition shown with the alternate long and short dash line of drawing 3 R> 3, and the difference of elevation between each solder bump B is absorbed, and each probe terminal 4 eats away certainly in each solder bump B, and it can contact certainly, and changes into the condition that it can flow through between a circuit tester and a bare chip T. If a predetermined checking signal is transmitted from a circuit tester in this condition, a bare chip T will receive a checking signal through the pattern electrode 3 and the probe terminal 4, the path of reverse is followed and an inspection result signal is transmitted to a circuit tester. Then, if a carrier descends and the solder bump B separates from the probe terminal 4, the probe terminal 4 will end inspection of return and a bare chip T to the condition shown with the original alternate long and short dash line from the condition shown as the continuous line of drawing 3, will carry out indexing of the bare chip T, and will move to inspection of the following bare chip T.

[0013] In case the probe terminal 1 eats into the solder bump B, shearing force acts from the edge around [a flat side] the head of the probe terminal 4 to the solder bump B, the solder bump's B front face is cut with an edge, and the probe terminal 4 begins to eat into the solder bump B. By lifting of the subsequent bare chip T, a good flow with interlocking and the solder bump B is secured gradually, extending the solder bump B to a perimeter by the peripheral surface of the probe terminal 4. If it inspects in this condition, transfer of a signal can be ensured between the probe terminal 4 and the solder bump B, and reliable inspection can be conducted.

[0014] The pattern electrode 3 which was formed in the front face of the ceramic substrate 2 according to this operation gestalt as explained above. It has the probe terminal 4 of the shape of a bump prepared in the front face of this pattern electrode 3. Are the contactor 1 used in case electrical-characteristics inspection of a bare chip T is conducted, and since the conductive tubular elastic member 5 was made to intervene between the probe terminal 4 and the pattern electrode 3, the supporting structure of the probe terminal 4 is easy. And the solder bump's B difference of elevation can be absorbed, and it can contact certainly to the solder bump B. According to this operation gestalt, since the probe terminal 4 is connected to the ceramic substrate 1 through wiring structure, electric resistance is small excellent in a RF property, and, moreover, can ensure high-speed inspection. Moreover, since the probe terminal 4 is formed in the shape of a bump, it can respond satisfactory at all also to the bare chip T formed into the ** pitch, and moreover, it can be based on the array of the electrode pad P of a bare chip T, the probe terminal 4 can be arranged, and the array degree of freedom can be raised. Moreover, since the above-mentioned probe terminal 4 was formed as a rectangular-head frustum-like bump, it can give shearing force from the edge around [a flat side] a head to the solder bump B, and can raise further interlocking and contact nature with the solder bump B certainly into the solder bump B.

[0015] It is necessary to take out to a commercial scene as KGD, and when trading with a bare chip T especially, where the solder bump B is moreover formed in an electrode pad in preparation for flip chip

mounting, it may take out to a commercial scene. In such a case, if the contactor 1 of this operation gestalt is used, contact for the solder bump B and the probe terminal 4 is good, and since [which spoils the solder bump B] there is nothing things, it can use suitably as a contactor for KGD. And when supplying KGD in the state of a wafer, it is also easy to make the contactor which inspects simultaneously two or more chips in the wafer condition.

[0016] In addition, although the above-mentioned operation gestalt explained the case where contacted the solder bump B and the probe terminal 4 was inspected, it can inspect similarly about the case where electrode pads, such as aluminum, are made to contact. Moreover, [0017]

[Effect of the Invention] According to invention of this invention according to claim 1 to 3, the supporting structure of a probe terminal is easy and can offer the contactor excellent in the contact nature which can moreover absorb the difference of elevation of an electrode.

[Translation done.]

* NOTICES *

JP0 and NCIP1 are not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.**** shows the word which can not be translated.

3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the perspective view expanding and showing the important section of the contactor of this invention.

[Drawing 2] It is the top view showing a part of contactor shown in drawing 1 .

[Drawing 3] It is the explanatory view of the probe terminal of a contactor shown in drawing 1 of operation.

[Drawing 4] It is the sectional view of a lengthwise direction showing the important section of a probe card conventional vertical needle type.

[Description of Notations]

1 Contactor

2 Ceramic Substrate

3 Pattern Electrode

4 Probe Terminal

5 Tubular Elastic Member

T Bare chip

B Solder bump

[Translation done.]

* NOTICES *

JP0 and NCIP1 are not responsible for any damages caused by the use of this translation.

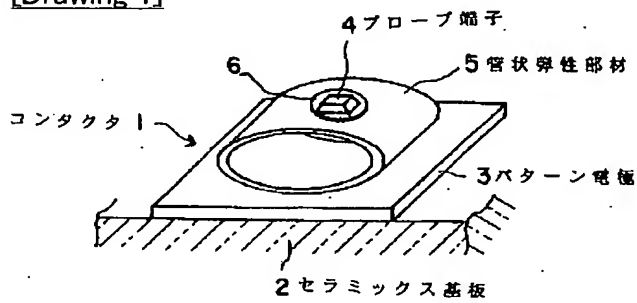
1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.**** shows the word which can not be translated.

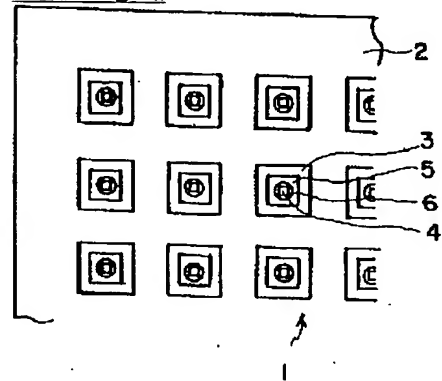
3.In the drawings, any words are not translated.

DRAWINGS

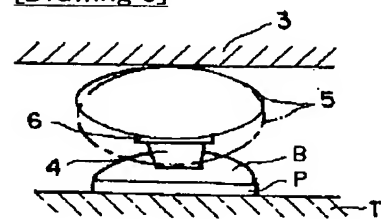
[Drawing 1]



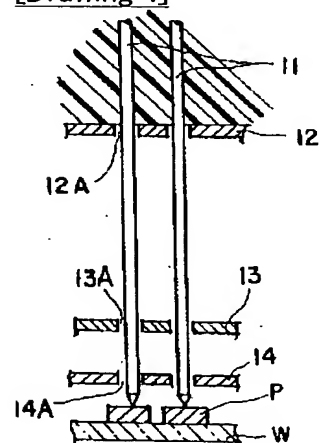
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Translation done.]

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

☒ **BLACK BORDERS**

☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**

☐ **FADED TEXT OR DRAWING**

☒ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**

☐ **SKEWED/SLANTED IMAGES**

☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**

☒ **GRAY SCALE DOCUMENTS**

☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**

☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**

☐ **OTHER:** _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.